

greater energy during the night of the 6th and concentrated just north of the Ohio River.

At Louisville the barograph registered the least pressure, 28.90 inches (actual), about 3:40 a. m. of the 7th. This was followed by a sudden increase, amounting to .15 inch within thirty minutes. The temperature at Louisville at 3 a. m. of the 7th was 67°, very high for the hour and season.

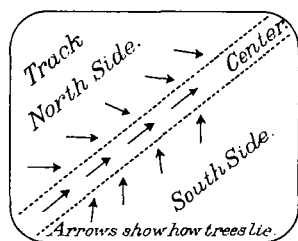
Thunderstorms, high winds, and heavy rains were general throughout the Ohio Valley during the same night.

At Cecilian, in Hardin County, two churches and several smaller buildings were destroyed and many houses unroofed or severely damaged. One of the churches, a very substantial brick building, was leveled to the ground, with the exception of a portion of the front wall, which was left standing. The rectory, standing within a few feet of the church, was uninjured. The other church was a lighter building. This was entirely demolished, even the foundation stones being moved out of place.

This occurred about 4:30 in the morning of the 7th. The destructive part of the storm lasted less than five minutes. The sky was inky black, except when lighted by vivid flashes of lightning.

Rev. J. J. Abell, of Bethlehem Academy, St. John, Hardin County, reports:

The violent storm of February 7 passed through the southeast side of Cecilian, which is 4 miles southeast of here. The exact time at Cecilian was at 4:25 a. m., central time. The rain was very heavy for about fifteen minutes. The direction of the storm's movement through Cecilian was north 51° east; the path of greatest destruction was about 3 miles long and 240 yards wide. Lightning was almost continuous. The direction in which trees fell is shown by the accompanying diagram.



In Ohio County, about 3:45 the same morning, a similar storm struck the little village of Narrows, practically wiping it out. The town consisted of about thirty residences and six business houses, and of these not one escaped severe injury and many were entirely destroyed. The path of this tornado seems to have extended from Dundee to Narrows, a distance of about 3 miles.

In many other localities in the central and northern portions of the State destructive storms occurred about the same time. Great damage was done to buildings and much property destroyed, but strange to say no lives were lost.

TORNADO AT MERIDIAN, ILL.

The following is summarized from a report, accompanied by a clipping from the Cairo Citizen, by Mr. Lewis Redding, of a tornado that struck the residence of the latter at Meridian, Ill., on February 7. The family were awakened by a clap of thunder, "the loudest I ever heard" at about 2 a. m., and the tornado struck the house a minute later with a roar like a train of cars. The building, which was two stories and a half high and very substantially built, was lifted from its brick foundations, turned around, and dropped. All the other buildings on the place, with the exception of the barn, were wrecked, and portions of them were carried more than a mile away. An oak tree 20 inches in diameter was twisted into splinters. The storm moved from southwest to northeast, over a path ten rods in width. The shape and motion of the clouds could not be observed, but the manner in which the debris was scattered indicates that the wind had the whirling motion characteristic

of tornadoes. There was no loss of life, and the property loss, exclusive of damage to the house, was about \$3000.

Meridian is about two miles east of Villa Ridge and 9 miles north of Cairo. The Weather Bureau office at Cairo reports a storm accompanied by extremely vivid lightning and moderate thunder. The wind reached a maximum velocity of 66 miles per hour at 2:41 a. m., and considerable damage was done.

RAIN AT FREEZING TEMPERATURES.

By E. D. EMIGR, Assistant Observer, Dodge City, Kans.

As my reports of rain and freezing temperatures at 8 p. m., January 1, and 8 a. m., February 17, have been questioned because of their apparent inconsistency, I would report in detail the following extract from the station record:

January 1, 1904.—Light misty rain, amounting to .02 of an inch, fell from 9:15 a. m., to 8:45 p. m., seventy-fifth meridian time, the maximum temperature during the entire duration of the storm being 23°, while a minimum of 20° was recorded. Though light snow accompanied the rain at intervals during the afternoon, the mist reached the ground in liquid form, and froze in solid sheets of ice on the sidewalks, sides of buildings, the ground, and whatever else it struck, indicating conclusively the existence of a stratum of warm air at no great elevation.

February 17, 1904.—In all essential particulars, this storm was identical with that of January 1. The existing temperature and its range, the character and amount of precipitation, and the prevalence of northerly wind and rising pressure were almost exactly the same. In this storm, however, no snow accompanied the rain, and it may also be of interest to note that several hours of its duration were at night.

The determination of the direction of cloud movement in these disturbances is a matter of considerable difficulty, but clearing weather about six hours after the ending of precipitation on the 17th of February disclosed a moderate velocity from the southwest at the stratus cloud level. It seems that the air currents even at comparatively low elevations have directions differing very materially from those at the earth's surface.

FORMATION OF CLOUDS OVER LAKE MICHIGAN IN WINTER.

By REV. CHARLES H. LEE, Racine, Wis., February 14, 1904.

The influence of lakes on local climate has been frequently referred to in the MONTHLY WEATHER REVIEW.¹ The following remarks contained in a letter to Prof. Frank H. Bigelow from Rev. Charles H. Lee, of Racine, Wis., under date of February 14, 1904, throw additional light upon the subject, since this careful observer has watched the formation of clouds over the lake as observers can not do at stations farther east, because so much of the time they are enveloped in the clouds:

Has the station at Milwaukee this winter noted the frequency of cloud movements from the northeast during periods of high? Apparently these movements occur with the onset of a southwestern low, and they are almost always followed by a northeaster, and consequent rise in surface temperature. Sometimes these clouds come up against a clear sky; sometimes against a sky marked by a thin line of cirrus, which seem to move more from the west than from the northwest, surface currents being always at these times from the northwest. I have several times predicted warmer weather and northeast winds, and I don't think I have missed it once. The clouds from the northeast are clearly aqueous vapor from over the lake, and can be seen gathering on the eastern horizon and slowly moving landward. It usually happens about noon, after a clear, cold morning, with the temperature about 0° F. When the temperature is below 0°, the whole surface of the lake steams like a boiling kettle, but when the sun is well up and the temperature has risen to +5° or +10° the steaming ceases and the eastern sky is massed full of this accumulated vapor, which seems to break off and slowly float shoreward, sometimes almost like a small summer cumulus. It makes an excellent illustration of your remark that "masses of air at different temperatures are reluctant to lose their individuality." It is usually about twelve to eighteen hours before the northeast surface current is established. Once or twice it lasted only a short time, the wind backing again to the northwest.

Just now things are peculiar, the lake being frozen wholly over for several miles, to the utter confusion of gulls and fish ducks, which are reduced to semistarvation and come ashore in flocks to attack garbage piles and sewer openings, and pathetically hunt possible air-holes. Yes—

¹See Monthly Weather Review, 1891, Vol. XXIX, pp. 422 and 563; 1892, Vol. XXX, p. 135.

terday a flock of fish ducks sat on the ice over what was an air-hole the day before, and consequently covered with thin, transparent ice. Whether they saw minnows and perch swimming underneath I don't know, but they were motionless for an hour or more. Sailors say the lake is frozen across to Michigan, but that idea is nonsense and is exploded by the fact that my "pillar of cloud" is over the eastern horizon just the same, which it would not be but for open water.

REMARKABLE METEORS.

By Lieut. FRANK H. SCHOFIELD, U. S. Navy.

The following report, as kindly communicated by the editor of the Pilot Chart, is dated U. S. S. *Supply*, at sea, latitude 36° 20' north; longitude 127° 36' west, February 28, 1904:

1. I have the honor to report that three somewhat remarkable meteors were observed from this ship at 6:10 a. m. (Greenwich mean time 3 hours 12 minutes) February 28, 1904, in latitude 35° 58' north, longitude 128° 36' west.

2. The meteors appeared near the horizon and below the clouds, traveling in a group from northwest by north (true) directly toward the ship. At first their angular motion was rapid and color a rather bright red. As they approached the ship they appeared to soar, passing above the clouds at an elevation of about 45°. After rising above the clouds their angular motion became less and less until it ceased, when they appeared to be moving directly away from the earth at an elevation of about 75° and in direction west-northwest (true). It was noted that the color became less pronounced as the meteors gained in angular elevation.

3. When sighted, the largest meteor was in the lead, followed by the second in size at a distance of less than twice the diameter of the larger, and then by the third in size at a similar distance from the second in size. They appeared to be traveling in echelon, and so continued as long as in sight.

4. The largest meteor had an apparent area of about six suns. It was egg-shaped, the sharper end forward. This end was jagged in outline. The after end was regular and full in outline.

5. The second and third meteors were round and showed no imperfections in shape. The second meteor was estimated to be twice the size of the sun in appearance, and the third meteor about the size of the sun.

6. When the meteors rose there was no change in relative positions; nor was there at any time any evidence of rotation or tumbling of the larger meteor.

7. I estimated the clouds to be not over one mile high.

8. The near approach of these meteors to the surface and the subsequent flight away from the surface appear to be most remarkable, especially so as their actual size could not have been great. That they did come below the clouds and soar instead of continuing their southeasterly course is also equally certain, as the angular motion ceased and the color faded as they rose. The clouds in passing between the meteors and the ship completely obscured the former. Blue sky could be seen in the intervals between the clouds.

9. The meteors were in sight over two minutes and were carefully observed by three people, whose accounts agree as to details. The officer of the deck, Acting Boatswain Frank Garvey, U. S. Navy, sighted the meteors and watched them until they disappeared. He sent a messenger to me who brought an unintelligible message. When I arrived on the bridge the meteors had been observed for about one-half of a minute.

PRECIPITATION FOR TWENTY-NINE YEARS AT DODGE CITY, KANS.

By E. D. EMIGR, Official in Charge.

In studying the adaptability of a climate to the requirements of any particular crop, only the data for the germinating and growing season should be considered. It is not an uncommon mistake to base conclusions upon figures showing the total precipitation and mean temperature of the entire year, whereas, the applicable data probably covers a period of not over six months. For facility in this work, figures for each month and each quarter of the calendar year have been compiled.

Amounts of moisture that would not be sufficient to be of great practical value in the hot months are frequently of very great importance when received by the soil at a more favorable season. Heavy snow slowly melted, or a gradual soaking rain at a time of comparatively inactive evaporation, is more beneficial by far than the heavy downpours so common to the summer months. In this connection it is interesting to note that the large wheat yields of 1892 and 1903, in Ford County, were produced under conditions of deficient rainfall, not only for the year, but for the crop season as well. In both in-

stances the soil was blessed with an unusually abundant supply of moisture early in the season, and was subsequently benefited by timely rainfall.

After a careful investigation of the records of this station, published herewith, and of the records of the western third of the State for sixteen years, we feel justified in making the statement that there is no foundation in fact for the assertion that the rainfall in western Kansas is increasing from year to year.

Precipitation, Dodge City, Kans.

Year.	First quarter.	Second quarter.	Third quarter.	Fourth quarter.	Annually.
	Inch.	Inch.	Inch.	Inch.	Inch.
1874.....				0.56
1875.....	0.26	3.70	6.66	0.15	10.77
1876.....	3.64	3.84	5.42	2.50	15.40
1877.....	0.99	12.26	6.38	8.26	27.89
1878.....	2.35	7.88	6.85	0.88	17.96
1879.....	1.12	5.70	8.45	0.16	15.43
1880.....	0.04	5.03	9.49	3.88	18.44
1881.....	2.28	16.97	10.55	3.75	33.55
1882.....	0.98	6.03	4.26	1.84	13.14
1883.....	2.28	12.12	9.59	4.51	28.50
1884.....	2.27	13.21	11.45	3.43	30.36
1885.....	1.74	7.48	11.31	3.18	23.71
1886.....	3.78	7.77	6.86	0.94	19.35
1887.....	0.77	10.15	3.42	1.37	15.71
1888.....	1.89	12.10	7.85	1.10	22.94
1889.....	3.41	7.09	5.02	3.65	19.17
1890.....	0.86	5.09	4.24	1.53	11.72
1891.....	4.57	12.39	11.08	4.30	32.34
1892.....	3.88	6.97	6.39	2.42	19.66
1893.....	0.36	2.11	6.88	0.77	10.12
1894.....	1.47	5.63	4.23	1.27	12.60
1895.....	4.15	7.20	7.32	1.64	20.31
1896.....	0.74	8.61	7.20	3.32	19.87
1897.....	4.08	7.01	7.57	2.92	21.58
1898.....	2.68	15.85	8.56	4.37	31.46
1899.....	0.75	13.22	8.77	5.71	28.45
1900.....	1.74	8.90	9.02	1.10	20.76
1901.....	1.41	7.83	5.06	1.76	16.06
1902.....	2.08	6.60	5.95	3.07	17.70
1903.....	3.62	6.34	2.95	2.36	15.27
Averages:					
Rainfall.....	2.07	8.45	7.19	2.64	20.35
Rainy days.....	16	25	20	14	75
Temperature.....	34°	64°	74°	43°	54°

A rainy day is one with 0.01 of an inch or more of precipitation.

Total amount in the wettest year, 33.35 inches in 1881.

Total amount in the driest year, 10.12 inches in 1893.

Total in the wettest first quarter year, 4.57 inches in 1891.

Total amount in the driest first quarter, 0.04 inch in 1880.

Total in the wettest second quarter year, 16.97 inches in 1881.

Total in the driest second quarter year, 2.11 inches in 1893.

Total in the wettest third quarter year, 11.45 inches in 1884.

Total in the driest third quarter year, 2.95 inches in 1903.

Total in the wettest fourth quarter year, 8.26 inches in 1877.

Total in the driest fourth quarter year, 0.15 inch in 1875.

Wettest month was May, 1881, with 12.82 inches.

Driest month was December, 1889, with none.

Greatest average monthly number of rainy days, 10 in June.

Least average monthly number of rainy days, 4 in January and November.

Temperature: Annual mean, 54°; warmest month is July, with an average of 78°; coldest month is January, with an average of 28°.

Though the successive periods from the sowing to the maturing of winter wheat overlap to a certain extent, in this region they conform quite closely to the calendar quarters, and it is mainly on this account that this division of the year was selected for the above table. The fact that the growing season for our principal spring crops, oats and barley, ends late in June or early in July also makes this method more desirable for the study of climate and crops than the seasonal division of the so-called meteorological year.

To summarize in a brief and general way, July, August, and